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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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*Ex parte* ERIC VANCE KLINE

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Appeal 2009-003893  
Application 09/759,018  
Technology Center 2800

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Mailed: November 12, 2009

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Before DALE M. SHAW, *Administrator*

ERRATUM

The Decision on Appeal (Decision) for the above identified application, mailed October 29, 2009, contains an attached Article entitled “*Advanced Inorganic Chemistry*,” Sixth Edition, John Wiley & Sons, Inc., 486-488 (1999) (hereafter, Article). The Article, on page 17, appears to be partially unreadable. A copy of the Decision with a legible version of the entire Article is included as an attachment to this Erratum.

Appeal 2009-003893  
Application 09/759,018

All other portions of the Decision on Appeal remain unchanged. The timeliness established by the October 29, 2009, decided date, also remains unchanged.

If there any questions pertaining to this Erratum, please contact the Board of Patent Appeals and Interferences at 571-272-9797.

DMS/sld

INTERNATIONAL BUSINESS MACHINES CORPORATION  
DEPT. 18G  
BLDG. 300-482  
2070 ROUTE 52  
HOPEWELL JUNCTION, NY 12533

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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*Ex parte ERIC VANCE KLINE*

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Appeal 2009-003893  
Application 09/759,018  
Technology Center 2800

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Decided: October 29, 2009

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Before CATHERINE Q. TIMM, KAREN M. HASTINGS, and  
JEFFREY B. ROBERTSON, *Administrative Patent Judges*.

HASTINGS, *Administrative Patent Judge*.

**DECISION ON APPEAL**

Appellant appeals under 35 U.S.C. § 134(a) from the Examiner's final rejection of claims 4-13. We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM, but designate our affirmance as including new grounds of rejection under 37 CFR § 41.50(b).

**STATEMENT OF THE CASE**

The invention relates to a composition for containing metal ions in an electronic device. The electronic device has an integrated circuit with the inventive composition. The composition may be "contained within" a scratch coat, an encapsulant, an underfill, an organic package, a printed

circuit board or a conformal coating (Spec. 3:10; 3:13; 3:15; 3:16; 3:20; 3:21). Claim 4 is illustrative:

4. An electronic device having an integrated circuit with a composition for containing metal ions, said composition comprising:

a matrix material;

a polymer which serves as an insoluble and immobile particle phase in said matrix material; and

a chelating agent which is bonded to said insoluble and immobile particle phase.

The Examiner relies upon the following prior art references in the rejections of the appealed claims:

Berger	4,030,948	Jun. 21, 1977
Ikeda	5,973,930	Oct. 26, 1999
Raiser	6,700,209	Mar. 2, 2004

The Examiner rejected:

a) claims 4 and 5 under 35 U.S.C. § 102(b) as being anticipated by Berger;

b) claims 4-10<sup>1</sup> under 35 U.S.C. § 103(a) as being unpatentable over the combined prior art of Berger and Raiser; and

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<sup>1</sup> While the Examiner did not include claim 10 in the statement of the rejection, claim 10 was addressed in the body of the rejection (Ans. 8). Appellant agrees that claims 4-13 are on appeal (App. Br. 2). Accordingly the Examiner's oversight was harmless error.

c) dependent claims 11-13 under 35 U.S.C. § 103(a) as being unpatentable over the combined prior art of Berger, Raiser, and Ikeda.

Appellant focuses his remarks on claim 4 for each of the first and second grounds of rejection. Appellant only separately argue with any reasonable specificity dependent claims 9 and 12. Therefore, we will mainly focus on independent claim 4 to decide the issue in the first and second grounds of rejection on appeal, but will separately address dependent claim 9, as well as dependent claim 12 in the third ground of rejection. 37 C.F.R. § 41.37(c)(1)(vii)(2006).

*The § 102 Rejection*

**ISSUE ON APPEAL**

Has the Appellant shown that the Examiner reversibly erred in rejecting the claims because:

- (a) Berger does not disclose a “polymer which serves as an insoluble and immobile particle phase in [a] matrix material” as recited in claim 4; and
- (b) Berger does not disclose “a chelating agent which is bonded to said . . . phase” as recited in claim 4?

This issue turns on the broadest reasonable interpretation of the above noted claim language.

**PRINCIPLES OF LAW**

*Claim Construction*

During examination of a patent application, a claim is given its broadest reasonable construction “in light of the specification as it would be interpreted by one of ordinary skill in the art.” *In re Am. Acad. of Sci. Tech. Ctr.*, 367 F.3d 1359, 1364 (Fed. Cir. 2004). Although claims are to be interpreted in light of the specification, limitations from the specification are

not to be read into the claims. *See In re Van Geuns*, 988 F.2d 1181, 1184 (Fed. Cir. 1993); *see also, e.g.*, *In re Zletz*, 893 F.2d 319, 321-22 (Fed. Cir. 1989). An applicant seeking a narrower construction must either show why the broader construction is unreasonable or amend the claim to expressly state the scope intended. *In re Morris*, 127 F.3d 1048, 1057 (Fed. Cir. 1997).

It is well established that the transitional term "including", which is synonymous with "comprising", is inclusive or open-ended and does not exclude any additional, unrecited elements. *See Mars, Inc. v. H.J. Heinz Co.*, 377 F.3d 1369, 1376 (Fed. Cir. 2004).

#### *Anticipation*

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *See Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631 (Fed. Cir. 1987).

However, the law of anticipation does not require that the reference "teach" what the subject patent (or application) teaches. Assuming that a reference is properly "prior art," it is only necessary that the claims, as construed, "read on" something disclosed in the reference, i.e., all limitations of the claim are found in the reference, or "fully met" by it. *See Kalman v. Kimberly-Clark Corp.*, 713 F.2d 760, 772 (Fed. Cir. 1983).

#### FINDINGS OF FACTS (FF)

Findings of fact throughout this decision are supported by a preponderance of the evidence.

Appellant's Specification contains no explicit definition of "matrix", "phase", or "bonded". Indeed, Appellant's Specification never uses the word "matrix", nor do any of the original claims (*see generally* Spec.).

Appellant's Specification does not describe any examples of "the polymer which serves as an insoluble and immobile particle phase", nor does it describe any specific examples of the "bonding" of the chelating agent to the "phase" (*see generally* Spec.). Indeed, the Specification only depicts chelating agent 120 spaced apart from the exemplified particle 110 to which 120 is "bonded" (Spec. 6: 9-12; Fig. 1).

The plain meaning of the word "matrix" encompasses "something from which something else originates, develops, or takes form" and "material in which something is enclosed or embedded".<sup>2</sup>

The plain meaning of the word "phase" encompasses "an aspect or part under consideration"<sup>3</sup> or "any of the major aspects in which a thing of varying forms and conditions manifests itself".<sup>4</sup>

The plain meaning of the word (verb) "bond" encompasses "to cause to adhere firmly", "to embed in a matrix" and "to hold together or solidify by or as if by means of a bond or binder".<sup>5</sup>

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<sup>2</sup> "matrix" *Merriam-Webster's Collegiate Dictionary, Tenth Edition*, Merriam-Webster, Incorporated, 1999, p. 717.

<sup>3</sup> "phase" *Merriam-Webster's Collegiate Dictionary, Tenth Edition*, Merriam-Webster, Incorporated, 1999, p. 717.

<sup>4</sup> "phase" *The Random House College Dictionary*, Random house, Inc., 1973, p. 995.

<sup>5</sup> "bond" *Merriam-Webster's Collegiate Dictionary, Tenth Edition*. Merriam-Webster, Incorporated, 1999, p. 130.

Berger describes a “conformal protective coating material” (col. 3, ll. 46-60). The material may be “modified with chelating materials admixed therewith or chemically bonded thereto” (col. 4, ll. 6-9).

Berger then describes a block copolymer composition for use as the conformal coating comprising structural units 1, 2, and optionally 3 (col. 5, ll. 2-48). The structural unit 1 of the block copolymer of Berger may reasonably be viewed as a “matrix material”, and structural unit 2 of the block copolymer of Berger may reasonably be viewed as a “polymer which *serves as* an insoluble and immobile phase”.

One of ordinary skill in the art would have immediately appreciated that the carboxyl groups depicted on structural unit 2 of Berger are a chelating agent<sup>6</sup>.

## ANALYSIS

Appellant’s disagreement with the Examiner’s rejection focuses on the alleged deficiencies of Berger as set out in the issue above.

Implicit in our review of the Examiner’s anticipation analysis is that the claim must first have been correctly construed to define the scope and meaning of each contested limitation. *See Gechter v. Davidson*, 116 F.3d 1454, 1457 (Fed. Cir. 1997). In particular, the Appellant and the Examiner disagree on the interpretation of each of the limitations of “a matrix material”, “a polymer which *serves as* an insoluble and immobile particle phase” and “a chelating agent which is bonded to said . . . phase” (emphasis added) as recited in claim 4.

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<sup>6</sup> Cotton et al, *Advanced Inorganic Chemistry*, John Wiley & Sons, Inc., 1999, pp. 486-488.

Appellant argues that the Examiner is “misunderstanding” the Berger reference as well as his invention (Reply Br. 2). Appellant conceded “[t]he Examiner has shown a matrix material” in Berger (Reply Br. 3) but has not shown a polymer serving as a phase and a chelating agent bonded thereto (*id.*) The Examiner argues for a broader reading such that the “silicone containing polyimide” composition of Berger relied upon does “read on” the claimed “matrix” as well as the “polymer phase”, and such that the diamine portion of Berger’s composition relied upon does “read on” the claimed “chelating agent” (Ans. 3, 4).

Appellant has the burden of showing that the Examiner’s interpretation of the disputed terms is unreasonable.

We find no basis in the claim language or in the disclosure in the Specification on which to read the disputed language in the narrow sense urged by Appellant as a limitation into claim 4. The Specification contains no explicit definitions of any of the terms in dispute, or any examples of the “polymer which serving as an . . . immobile phase” (*see FF*).

While Appellant urges that “an example of a matrix material . . . is . . . a conventional encapsulant” (App. Br. 4), it is also well established that claims are not limited to examples in the Specification. Accordingly, we find no basis in the claim language or in the disclosure in the Specification on which to read limitations on the “matrix”, “polymer . . . phase” and “bonded” into claim 4.

The plain meaning of these terms encompasses the composition of Berger, especially in light of the Specification’s failure to describe a) any specific examples of the polymer phase, b) how such a phase co-exists with the “matrix material”, and c) how the chelating agent is bonded to the phase.

The “matrix material” reads on the structural unit 1 of the block copolymer of Berger, and “the polymer which *serves as* an insoluble and immobile *phase*” reads on structural unit 2 of the block copolymer of Berger.

Appellant indeed concedes that “polyimide can only be soluble within polyimide” (App. Br. 6) and thus contrary to Appellant’s conclusion, it is reasonable to view polyimide as “serving as an insoluble and immobile particle phase” in the composition of Berger.

Appellant has also not cited any evidence or technical reasoning as to why the diamine portion of the block copolymer would not function as a chelating agent. In any event, as even Appellant’s concede (App. Br. 7), Berger describes that the material may contain a chelating agent “bonded thereto” (*see FF*). Furthermore, the “chelating agent which is bonded to said. . . phase” also reads on the carboxyl groups depicted in structural unit 2 (*see FF*).

Appellant’s contention that even if the elements in Berger are “all bonded permanently together” that is an “incomplete” statement which “misses the point” of claim 4 (Reply Br. 3) is not persuasive of any error. Appellant’s claim language does not in any way distinguish over the elements of Berger all permanently bonded together (e.g., reacted together).

While the Examiner’s claim construction is broad, the literal language of claim 4 is also broad. We cannot say that the Examiner’s construction is unreasonable. Furthermore, as discussed above, the use of the carboxyl groups of Berger as the chelating agent and/or the use of a chelating agent bonded thereto as described in Berger (col. 4, ll. 6-9) also are encompassed by the language of claim 4.

## Conclusion

Therefore, for the foregoing reasons and those stated in the Answer, we sustain the § 102 rejection advanced by the Examiner in this appeal.

### *The § 103 Rejections*

#### Principles of Law

“[I]f a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill.” *KSR Int'l Co. v. Teleflex, Inc.*, 550 U.S. 398, 417 (2007).

“It is *prima facie* obvious to combine two compositions each of which is taught by the prior art to be useful for the same purpose, in order to form a third composition which is to be used for the very same purpose.” *In re Kerkhoven*, 626 F.2d 846, 850 (CCPA 1980).

“[I]n considering the disclosure of a reference, it is proper to take into account not only specific teachings of the reference but also the inferences which one skilled in the art would reasonably be expected to draw therefrom.” *In re Preda*, 401 F.2d 825, 826 (CCPA 1968).

#### Additional Findings of Fact

Appellant describes that their inventive composition may be “contained within” any one of seven “*conventional host elements*”, made of “any *conventional material* used in semiconductor manufacturing for protecting semiconductor devices (Spec. 10:19 to Spec. 11:2; emphasis added). These conventional materials include a scratch coat, an encapsulant, an underfill, a package, a printed circuit board, and a conformal coating (*id*).

Raiser describes an integrated circuit package that exemplifies the use of an encapsulant and an underfill (col. 2, ll. 25-32).

Berger describes a “conformal protective coating” (e.g., col. 1, ll. 8-9), which also is “resistant to scratching” (see col. 4, l. 65).

One of ordinary skill in the art would have appreciated that Berger’s protective coating would have been useful as any of the conventional protective coatings used in semiconductor manufacturing.

### Analysis

Appellant contends that the combination of Berger and Raiser is “deficient for the same reasons that the anticipation rejection of claim 4 is deficient” (App. Br. 8). We disagree for the same reasons set forth above in our analysis of the anticipation rejection.

Additionally, it would have been *prima facie* obvious to use both the protective conformal coating of Berger and the admittedly known conventional materials for protecting semiconductor devices, e.g., as exemplified by the encapsulant and underfill as shown in Raiser, since one would have been merely combining two compositions each known for the same purpose of protecting the semiconductor device. *Kerkhoven*, 626 F.2d at 850.

Once one combined the protective conformal coating of Berger with, e.g., the admittedly known conformal coating material, the “conventional” conformal coating would reasonably be considered a matrix material<sup>7</sup> and

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<sup>7</sup> Appellant states the matrix material may be a conventional encapsulant (Br. 4). When Appellant amended claim 4 to include the phrase “a matrix material”, he stated “[t]his matrix material may be, for example, a coating,

the composition of Berger would reasonably be considered the polymer phase and chelating agent bonded thereto.

With respect to dependent claim 9, Appellant's disagreement with the claim interpretation set forth by the Examiner (App. Br. 10) focuses on the limitation "wherein said composition is said organic package". However, Appellant's Specification does not explicitly define the term "organic package". The Specification states the inventive composition may be "contained in an organic package" (Spec. 9:14-15), and the package "may be a dielectric" (Spec. 9:17). Appellant admits that an organic package is a conventional protective material used in semiconductor manufacturing (*see* FF above). Accordingly, the Examiner's position that the claim reads on structure wherein the composition is part of an organic package is reasonable. The claim is open-ended and does not preclude other elements as part of the composition and/or as part of the organic package.

Likewise, Appellant's contention with respect to dependent claim 12 focuses on the interpretation of the limitation "wherein said composition is said printed circuit board" are also unavailing. Appellant's Specification does not explicitly define the term "printed circuit board". The Specification states the inventive composition may be "contained in" the printed circuit board (Spec. 10:5-8). Appellant admits that a printed circuit board is a conventional protective material used in semiconductor manufacturing (*see* FF above). Accordingly, the Examiner's position that the claim reads on structure wherein the composition is part of a printed circuit board is

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encapsulant, underfill, or even an organic package." (Response filed Jan. 4, 2005, p. 6)

reasonable. The claim is open-ended and does not preclude other elements as part of the composition and/or as part of the “printed circuit board.

#### Conclusion

Accordingly, on the record before us, the Appellant has not shown error on the part of the Examiner. It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the known elements of the prior art for their known functions to arrive at the claimed subject matter.

We therefore sustain the § 103 rejections advanced by the Examiner in this appeal.

#### ORDER

Upon consideration of the appeal, and for the reasons given herein, it is

ORDERED that the decision of the Examiner rejecting claims 4-13 over the prior art is affirmed,

FURTHER ORDERED that since our rationale for affirmance for each ground of rejection differs from the rationale of the Examiner, our affirmance is designated as including new rejections. 37 C.F.R. § 41.50(b) (2009),

FURTHER ORDERED that our decision is not a final agency action,

FURTHER ORDERED that within two (2) months from the date of our decision appellant may further prosecute the application on appeal by exercise one of the two following options:

1. Request that prosecution be reopened by submitting an amendment or evidence or both. 37 C.F.R. § 41.50(b)(1) (2009).
2. Request rehearing on the record presently before the Board.

Appeal 2009-003893  
Application 09/759,018

37 C.F.R. § 41.50(b)(2) (2009).

FURTHER ORDERED that no time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv) (2009).

AFFIRMED

New ground of rejection under 37 C.F.R. § 41.50(b)

PL Initial:  
sld

INTERNATIONAL BUSINESS MACHINES CORPORATION  
DEPT. 18G  
BLDG. 300-482  
2070 ROUTE 52  
HOPEWELL JUNCTION, NY 12533

<i>Notice of References Cited</i>		Application/Control No.	Applicant(s)/Patent Under Reexamination	
		09/759,018	Examiner Ishw Arhai Patel	Art Unit 2800      Page 1 of 1

*U.S. PATENT DOCUMENTS*

*	Document Number Country Code-Number-Kind	Date MM-	Name	Classification
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X	U	F. Albert Cotton and Geoffrey Wilkinson, "Advanced Inorganic Chemistry, Sixth Edition," pp.486-488 (1999).		
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*Sixth Edition*

# **ADVANCED INORGANIC CHEMISTRY**

### **F. Albert Cotton**

W. T. Doherty-Welch Foundation Distinguished Professor of Chemistry  
Texas A&M University  
College Station, Texas, USA

### **Geoffrey Wilkinson**

Sir Edward Frankland Professor of Inorganic Chemistry  
Imperial College of Science and Technology  
University of London  
London, England

### **Carlos A. Murillo**

Professor  
University of Costa Rica  
Ciudad Universitaria, Costa Rica  
Adjunct Professor  
Texas A&M University  
College Station, Texas, USA

### **Manfred Bochmann**

Professor  
School of Chemistry  
University of Leeds  
Leeds, England



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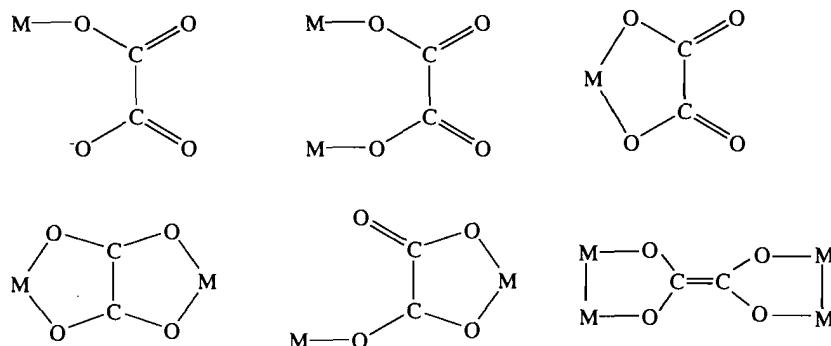
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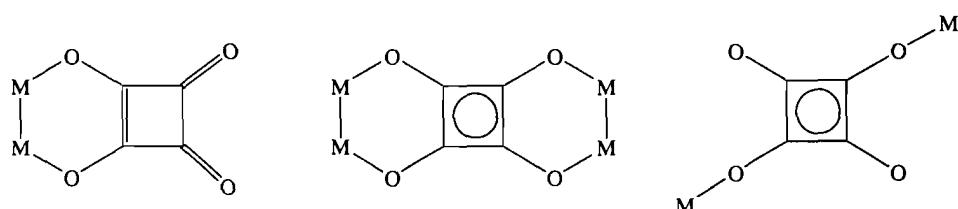
A few compounds are formed by spontaneous fixation of  $\text{CO}_2$  in air such as  $[\text{Ni}_3(\text{Me}_2\text{en})_6(\text{CO}_3)(\text{H}_2\text{O})_4](\text{ClO}_4)_4$ .<sup>123</sup>

*Oxalato complexes*<sup>124</sup> are also common, the main linkage types being



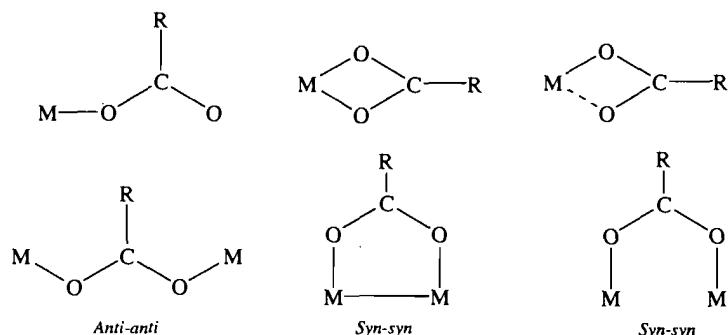
Typical chelate complexes are trisoxalato ions, for example,  $[\text{Co ox}_3]^{3-}$ . Many mono-, di-, and trithio oxalates are also known.<sup>125</sup>

*Squarates*<sup>126</sup> may act as chelates or bridges or form chains:



### Carboxylates<sup>127</sup>

The carboxylates are a very important class of ligands with the following bonding modes.



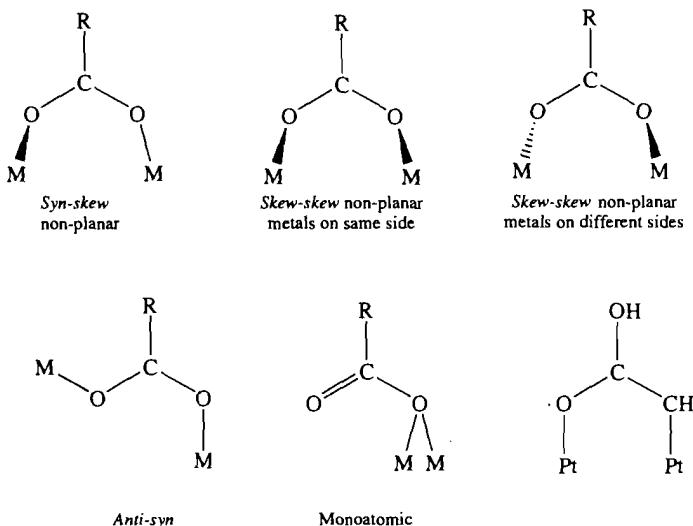
<sup>123</sup>T. Tanase, *Inorg. Chem.* **1992**, *31*, 1058.

<sup>124</sup>J. Glerup *et al.*, *Inorg. Chem.* **1995**, *34*, 6255; A. Bianchi *et al.*, *Inorg. Chem.* **1990**, *29*, 963.

<sup>125</sup>W. Dietzsch *et al.*, *Coord. Chem. Rev.* **1992**, *121*, 43.

<sup>126</sup>J. Sletten *et al.*, *Inorg. Chem.* **1995**, *34*, 4903; J.-C. Trombe *et al.*, *Inorg. Chim. Acta* **1995**, *230*, 1; **1992**, *195*, 193; **1990**, *167*, 69; J. M. Williams *et al.*, *Inorg. Chim. Acta* **1992**, *192*, 195; M. J. Sisley and R. B. Jordan, *Inorg. Chem.* **1991**, *30*, 2190.

<sup>127</sup>T. G. Appleton *et al.*, *Inorg. Chem.* **1995**, *34*, 5646; T. C. W. Mak *et al.*, *Polyhedron* **1997**, *16*, 897 and references therein; M. R. Sundberg *et al.*, *Inorg. Chim. Acta* **1995**, *232*, 1; X.-M. Chen and T. C. W. Mak, *J. Chem. Soc. Dalton Trans.* **1992**, 1585.



The most common forms are unidentate, symmetrical chelate, and symmetrical syn-syn bridging. Acetates and trifluoroacetates of weak Lewis acids are usually symmetric, those of very strong Lewis acids are often asymmetric. The other forms are not common, but anti-anti single bridging occurs in  $[\text{Mn salenCO}_2\text{Me}]_n$ , and anti-syn in  $[(\text{PhCH}_2)_3\text{SnO}_2\text{CMe}]_n$ . It is not uncommon to have more than one coordination type in the same molecule.<sup>128</sup>

The main types of bonding can often be distinguished by ir and nmr spectra. The syn-syn bridging  $\text{RCO}_2^-$  ligand is extremely common and important in compounds with  $\text{M}-\text{M}$  quadruple bonds.

In "ionic" acetates or in aqueous solution, the "free"  $\text{CH}_3\text{CO}_2^-$  ion has symmetric and antisymmetric C—O stretching modes at  $\sim 1415$  and  $1570 \text{ cm}^{-1}$ . These frequencies can vary by  $\pm 20 \text{ cm}^{-1}$ . Since the symmetry of even the free ion is low and it gives two ir-active bands, evidence for the mode of coordination must be derived from the positions rather than the number of bands. When the carboxyl group is unidentate, one of the C—O bonds should have enhanced double-bond character and should give rise to a high-frequency band. Such bands are observed in the  $1590$  to  $1650 \text{ cm}^{-1}$  region and are considered to be diagnostic of unidentate coordination.

Symmetrical bidentate coordination, as in  $\text{Zn}(\text{CH}_3\text{CO}_2)_2 \cdot 2\text{H}_2\text{O}$  and  $\text{Na}[\text{UO}_2(\text{CH}_3\text{CO}_2)_3]$ , and symmetrical bridging, as in the  $\text{M}_2(\text{O}_2\text{CCH}_3)_4\text{L}_2$  and  $\text{M}_3\text{O}(\text{O}_2\text{CCH}_3)_6\text{L}_3$  types of molecules, leaves the C—O bonds still equivalent, and the effect on the frequencies is not easily predictable. In fact, no criteria for distinguishing these cases have been found. In general, multiple bands appear between  $1400$  and  $1550 \text{ cm}^{-1}$ , the multiplicity being attributable to coupling between  $\text{CH}_3\text{CO}_2^-$  groups bonded to the same metal atom(s).

While acetates and other lower carboxylate complexes are prepared from the acids or alkali metal salts, for *formates* a different synthesis is the insertion reaction of  $\text{CO}_2$  into  $\text{M}-\text{H}$  bonds, for example,



<sup>128</sup>J. D. Martin and R. F. Hess, *Chem. Commun.* **1996**, 2419; H. W. Roesky *et al.*, *Inorg. Chem.* **1996**, 35, 7181; P. Lahuerta *et al.*, *Inorg. Chim. Acta* **1995**, 229, 203; F. A. Cotton and J. Su, *J. Cluster Sci.* **1995**, 6, 39.

Probably the only significant reaction of the carboxylate ligand is decarboxylation, which is catalyzed by transition metal species.<sup>129</sup>

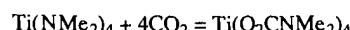
Straight-chain alkyl carboxylic acids derived from petroleum that also have a terminal cyclohexyl or cyclopentyl group are known as naphthenic acids. They form complexes, presumably polymeric, with many transition metals, and these compounds are freely soluble in petroleum. Copper naphthenates are used as fungicides, aluminum naphthenate was used as a gelling agent in "napalm," and cobalt naphthenates are used in paints.

There are, of course, more complicated carboxylic acids such as ethylenediaminetetraacetic acid that can function as multidentate ligands with both N and O bound to the metal. Also, *hydroxo carboxylic acids* such as citrate<sup>130</sup> readily form complexes in which both carboxylate and hydroxo groups are involved. Of such acids, probably the best studied are *tartrato complexes*.<sup>131</sup> A fairly common type of structure is one with bridges linking two metal atoms. A particular example is the antimony complex "tartar emetic." Because of the chirality and multiplicity of bonding possibilities, many isomers of tartrate complexes are possible, and the relative stabilities of these can be explained in terms of steric constraints of the binuclear structure and conformation of the tartrato groups, and depend strongly on the coordination geometry about the metal.

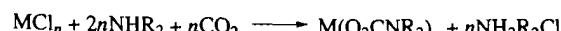
### Carbamates<sup>132</sup>

Complexes of  $R_2NCO_2^-$  are not as extensive or as useful as their sulfur analogues the dithiocarbamates (Sections 7-8 and 12-16).

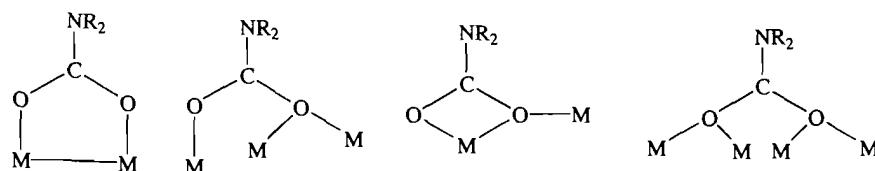
Carbamates are often obtained by insertion reactions of  $CO_2$ :



Such insertions may be carried out *in situ* as in reactions of cobalt or lanthanide halides with  $R_2NH$  and  $CO_2$  in hexane to give, for example,  $Co_6(O_2CNEt_2)_{12}$  or  $[Yb(O_2CNPr_2)_4]$ :



Although carbamates are mostly chelate, they can be unidentate and have bridging modes similar to  $CO_3^{2-}$  and  $RCO_2^-$ <sup>133</sup>



<sup>129</sup>D. J. Daresbourg *et al.*, *J. Am. Chem. Soc.* **1993**, *115*, 8839; M. Yashiro *et al.*, *Inorg. Chem.* **1994**, *33*, 1003.

<sup>130</sup>D. W. Wright *et al.*, *Inorg. Chem.* **1995**, *34*, 4194.

<sup>131</sup>J. J. Cruywagen *et al.*, *J. Chem. Soc. Dalton Trans.* **1990**, 1951.

<sup>132</sup>W. L. Gladfelter *et al.*, *J. Am. Chem. Soc.* **1992**, *114*, 8933.

<sup>133</sup>M. H. Chisholm *et al.*, *J. Am. Chem. Soc.* **1989**, *111*, 8149.